

REPORT DOCUMENTATION PAGE					Form Approved OMB No. 0704-0188	
<p>The public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to the Department of Defense, Executive Service Directorate (0704-0188). Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.</p> <p><b>PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ORGANIZATION.</b></p>						
1. REPORT DATE (DD-MM-YYYY) 09/15/2018		2. REPORT TYPE Journal			3. DATES COVERED (From - To)	
4. TITLE AND SUBTITLE Gastric Volvulus: ED Presentation, Evaluation, and Management				5a. CONTRACT NUMBER		
				5b. GRANT NUMBER		
				5c. PROGRAM ELEMENT NUMBER		
				5d. PROJECT NUMBER		
6. AUTHOR(S) Capt Ashley Werbin				5e. TASK NUMBER		
				5f. WORK UNIT NUMBER		
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) 59th Clinical Research Division 1100 Willford Hall Loop, Bldg 4430 JBASA-Lackland, TX 78236-9908 210-292-7141					8. PERFORMING ORGANIZATION REPORT NUMBER  17385	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) 59th Clinical Research Division 1100 Willford Hall Loop, Bldg 4430 JBASA-Lackland, TX 78236-9908 210-292-7141					10. SPONSOR/MONITOR'S ACRONYM(S)	
					11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release. Distribution is unlimited.						
13. SUPPLEMENTARY NOTES EMDocs.net						
14. ABSTRACT						
15. SUBJECT TERMS						
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON Clarice Longoria	
a. REPORT	b. ABSTRACT	c. THIS PAGE			19b. TELEPHONE NUMBER (Include area code) 210-292-7141	

## Gastric Volvulus: ED Presentation, Evaluation, and Management

**Author: Ashley Werbin, DO (Resident at SAUSHEC, USAF) // Edited by: Alex Koyfman, MD (@EMHighAK) and Brit Long, MD (@long\_brit)**

The views expressed are those of the authors and do not reflect the official views or policy of the Department of Defense or its Components.

### Case

A 60-year-old male with a past medical history of hypertension presents to the emergency department (ED) with a chief complaint of severe epigastric pain. The patient looks to be in extreme discomfort, doubled over on the stretcher. The patient's wife reports that her husband's symptoms began about one hour after dinner. Review of systems is remarkable for bloating, nausea, and vomiting, but the patient denies radiation of pain and diarrhea/constipation. He denies ever experiencing pain like this current episode. Vital signs include Temp 99°F, BP 164/94, HR 90, RR 16, SpO2 97% RA.

Unsure of the etiology of your patient's pain, the acute onset of his symptoms has you concerned. So, you begin to brainstorm the possibilities with particular attention paid to acute abdominal processes.

### Epidemiology of Gastric Volvulus

Gastric volvulus is a relatively uncommon diagnosis, with about 80-90% of cases occurring in adults and 10-20% in children, with an equal incidence among males and females.<sup>1,2,3,4</sup> Though unusual in adults younger than fifty years of age, those cases that do occur in children have been attributed to congenital diaphragmatic defects.<sup>1</sup>

While rare in its incidence, certain risk factors such as age greater than fifty years, phrenic nerve paralysis, stomach or splenic abnormalities, diaphragmatic irregularities, kyphoscoliosis, and diaphragmatic eventration increase the likelihood and possibility of the occurrence of gastric volvulus.<sup>2</sup>

### Pathophysiology

Gastric volvulus, as the name suggests, involves the rotation (or revolution) of the stomach about an axis. Like other organs within the abdomen and peritoneum, the stomach remains in a position of anatomic normalcy via the help of four different ligaments. The gastrophrenic ligament, gastrosplenic ligament, gastrohepatic ligament, and gastrocolic ligament serve to anchor the stomach to the diaphragm, spleen, liver, and colon, respectively.<sup>2</sup>

Gastric volvulus can occur idiopathically or secondary to some other cause. Those occurring idiopathically are generally due to abnormalities of the above gastric ligaments, leading to mobility of the stomach. Examples of causes that can lead to loosening of the gastric ligaments include mass effect from malignancy, adhesions from prior surgeries, or skeletal deformities that displace the abdominal organs producing tension and elongation of the ligaments over time.<sup>2</sup> Patients presenting with an idiopathic type gastric volvulus will complain of chronic symptoms due to the progressive slackening of these ligaments. Secondary volvulus is the result of some other anatomic abnormality causing the stomach to rotate. The most common cause of secondary volvulus is diaphragmatic defects, with paraesophageal hernia being the most common.<sup>2</sup>

The diagnosis of gastric volvulus is further classified based on the axis with which the stomach rotates, and there are two: organoaxial and mesenteroaxial.<sup>1,4</sup>

The organoaxial axis is a longitudinal axis that traverses the gastroesophageal junction and the pylorus, while the mesenteroaxial axis is a transverse axis that intersects the greater and lesser curvatures of the stomach.<sup>1,3,4</sup> With organoaxial rotation, the antrum rotates anterosuperiorly and the fundus rotates posterioinferiorly, leading to an inverted position.<sup>2</sup> Mesenteroaxial rotation, however, displaces the antrum above the gastroesophageal junction.<sup>2</sup> A diagnosis of gastric volvulus requires a rotation of the stomach greater than 180°. Those involving the organoaxial axis are more likely to achieve this degree of rotation, with mesenteroaxial rotation usually only partial.<sup>4</sup>

### Presenting Signs and Symptoms

As expected, the signs and symptoms of gastric volvulus involve some degree of abdominal pain. Gastric volvulus can present acutely or chronically with the following signs and symptoms: abdominal pain, chest pain, vomiting, dysphagia, bloating/distention, or indigestion. Borchardt's Triad is present in about 70% of acute gastric volvulus cases, which includes pain, vomiting, and the inability to pass a nasogastric (NG) tube.<sup>3</sup>

### Differential Diagnosis

The symptoms of gastric volvulus are non-specific; hence, the emergency physician must maintain a broad differential. Below is a table of diagnoses to consider when encountering the patient with undifferentiated abdominal/epigastric pain.

Diagnosis	Signs/Symptoms
Acute Myocardial Infarction	Chest pain (substernal; dull) lasting 15-30 minutes; pain may radiate to left arm, jaw, or back, and may be accompanied by shortness of breath, nausea/vomiting, and/or numbness/tingling. Isolated rise in cardiac biomarkers or rise in cardiac biomarkers with suggestive EKG changes <sup>5</sup>
Aortic Dissection	Sudden severe chest or upper back pain, shortness of breath, loss of consciousness, unequal pulses, blood pressure difference between right and left arms, and widening of the aorta on chest x-ray <sup>6</sup>
Esophagitis	Difficulty and/or painful swallowing (feeling of food stuck in throat), heart burn, unpleasant taste in mouth, hoarseness, chest pain, and/or halitosis <sup>7</sup>
Peptic Ulcer Disease	Upper abdominal pain/discomfort, epigastric pain that worsens with eating, postprandial belching, early satiety, and/or nausea and vomiting <sup>8</sup>
Gastritis	Nausea, abdominal pain or upset, vomiting, loss of appetite (a diagnosis of exclusion)
Cholelithiasis	Epigastric or RUQ pain that radiates to the right scapula; pain may be constant, sharp, crampy, or dull and generally begins postprandially (especially after fatty meals); clay-colored stools; nausea/vomiting <sup>9</sup>  Abdominal US: Echogenic foci with gravitational dependency <sup>10</sup>
Acute Cholecystitis	RUQ pain, fever, abdominal guarding, positive Murphy's sign, and leukocytosis  Abdominal US: Gallbladder wall thickening greater than 4-5mm and sonographic Murphy's sign
Budd Chiari Syndrome	Caused by occlusion of the hepatic veins that drain the liver leading to abdominal pain, ascites, and liver enlargement; may include fever, lower extremity edema, jaundice, GI bleeding, and/or hepatic encephalopathy <sup>11</sup>
Acute Cholangitis	Charcot's Triad: RUQ pain + jaundice + fever; Abnormal liver chemistries and an elevated white blood cell count with neutrophil predominance
Pancreatitis	Severe epigastric abdominal pain (which may be in the RUQ) and nausea/vomiting; worsened by food  Elevated lipase levels; commonly due to alcohol or gallstones
Splenic Infarction	LUQ pain; fever may be present; may have nausea/vomiting

	Elevated white blood cell count and elevated serum lactate dehydrogenase
Mesenteric Ischemia	Abdominal pain (out of proportion to physical exam); symptoms may be overshadowed by the disorders causing the intestinal ischemia (such as hypotension)
Gastric Perforation	Abdominal pain +/- abdominal distention and peritoneal signs  Abdominal X-Ray: Free air underneath the diaphragm, though this is not 100% sensitive
Pneumotosis Intestinalis	Abdominal pain, nausea/vomiting, diarrhea  Abdominal X-Ray: Air/gas within the walls of the small/large intestine
Gastric Outlet Obstruction	Cramping abdominal pain, nausea, vomiting, and inability to pass gas and/or stool  Abdominal X-Ray: Upright and supine showing air fluid levels and dilated loops of bowel (around a transition point)

## Diagnosis and Treatment

The diagnosis of gastric volvulus is largely dependent on the patient's clinical history and radiologic studies. According to the *Oesophagogastric Surgery* textbook, the best initial radiologic study is a chest x-ray. If diagnostic, the chest x-ray will show a "retrocardiac air fluid level and an air fluid level below [the level of] the diaphragm."<sup>4</sup> If the chest x-ray is inconclusive, the most definitive study is the barium swallow, which will show an obstruction at the level of the torsion.<sup>4</sup> While the barium swallow is highly sensitive and specific for diagnosing gastric volvulus, it is important to consider what additional information could be gained if a CT scan with oral contrast is conducted. If a CT scan with oral contrast is completed, the stomach should be seen in the chest cavity, and contrast will not be visible below the diaphragm. The benefit of a CT scan over a barium swallow is the ability to see other abdominal organs and structures and their spatial relationship to the stomach, which is especially helpful in determining if the gastric volvulus is of primary or secondary origin.

Acute gastric volvulus is a surgical emergency associated with significant morbidity and mortality if not diagnosed quickly.<sup>12</sup> Upon diagnosis of gastric volvulus, the first step in treatment is stabilizing the patient. IV fluids, analgesics, and antiemetics are essential. Adjuncts to this step include providing IV fluids and decompressing the stomach by inserting an NG tube and attaching it to suction. The NG must be placed carefully to avoid perforation, especially in the pediatric patient. If the placement of the NG tube is successful, surgery does not have to occur emergently. On the other hand, if unable to place an NG tube, the patient must undergo emergent decompression and derotation, and there are two ways to achieve this.<sup>2</sup>

Surgical management of acute gastric volvulus can be accomplished in two ways: endoscopic derotation with percutaneous endoscopic gastrostomy tube (PEG tube) placement or laparotomy. Endoscopic derotation and PEG tube placement involves manipulating/derotating the stomach with an endoscope and placement of two PEG tubes (in the gastric body and distal stomach) for several weeks to stimulate scar formation.<sup>2</sup> The goals of open surgery include: derotation of the volvulus, debridement of non-viable tissue (consequence of ischemia), reduction and closure of the hernia (if the volvulus is deemed to have been caused by a diaphragmatic defect), and gastropexy (or surgical fixation of the stomach) to prevent recurrence.<sup>4</sup>

## The Emergency Department Approach

Abdominal pain with or without nausea and vomiting characterizes a wide range of disorders. When addressing the patient presenting to the ED with these complaints, the emergency physician should always:

- Assess the patient's airway, breathing, and circulatory status intervening when necessary, while obtaining your safety net of bilateral IV's, O2, monitors, and pulse oximetry



- Resuscitate with IV fluids and antimicrobials if the patient meets SIRS criteria and infection is suspected
- Perform a thorough history regarding medical comorbidities, previous surgeries, and the onset and duration of symptoms
- Perform a focused physical exam paying particular attention to heart sounds, the presence of abdominal distention, dullness to percussion over the gastric area, and/or lack of bowel sounds
- Evaluate for cardiac etiology via EKG and serum cardiac biomarkers
- Utilize the history and physical, as well as other ancillary studies (chest x-ray) to make educated decisions regarding further evaluation, treatment, and disposition

### Key Points

- Perform a thorough history and physical exam by first addressing the stability of the patient's condition (airway, breathing, circulatory status)
- Obtain an EKG and serum cardiac biomarkers to rule out cardiac etiology in those patients presenting with undifferentiated epigastric pain
- Order a chest x-ray
  - If chest x-ray reveals air fluid levels above and below the diaphragm, administer IV fluids and insert nasogastric tube
    - Successful placement -> Non-emergent surgery
    - Unsuccessful placement -> Emergent surgery
  - If chest x-ray is inconclusive, consider CT scan with oral contrast or emergent barium swallow study

### References/Further Reading:

1. Hope, W. and Geibel, J. Gastric Volvulus. Medscape. 2017. Available from <http://emedicine.medscape.com/article/2054271-overview#a3>
2. Wee, J.O., Soybel, D.I. and Wenliang, C. Gastric volvulus in adults. Up to Date. July 2017. Available from [https://www.uptodate.com/contents/gastric-volvulus-in-adults?source=search\\_result&search=gastric%20volvulus&selectedTitle=1~14](https://www.uptodate.com/contents/gastric-volvulus-in-adults?source=search_result&search=gastric%20volvulus&selectedTitle=1~14)
3. Wani, B.N. and Jajoo, S. Gastric volvulus. Indian Journal of Surgery. 2010; 72:163-164. DOI: 10.1007/s12262-010-0039-y.
4. Bronson, N.W., Perry, K.A. and Hunter, J.G. Paraesophageal hernia and gastric volvulus. In: *Oesophagogastric Surgery*. 5<sup>th</sup> ed. Saunders Elsevier, 2014:308-316.
5. Reeder, G.S. and Kennedy, H.L. Criteria for the diagnosis of acute myocardial infarction. Up to Date. July 2016. Available from [https://www.uptodate.com/contents/criteria-for-the-diagnosis-of-acute-myocardial-infarction?source=search\\_result&search=acute%20myocardial%20infarction&selectedTitle=2~150](https://www.uptodate.com/contents/criteria-for-the-diagnosis-of-acute-myocardial-infarction?source=search_result&search=acute%20myocardial%20infarction&selectedTitle=2~150)
6. Diseases and Conditions Aortic Dissection. Mayo Clinic. 2014. Available from <http://www.mayoclinic.org/diseases-conditions/aortic-dissection/basics/definition/con-20032930>
7. Cunha, J.P. Esophagitis. E-Medicine Health. 2016. Available from [http://www.emedicinehealth.com/esophagitis/page2\\_em.htm](http://www.emedicinehealth.com/esophagitis/page2_em.htm)
8. Vakil, N.B. Peptic ulcer disease: Clinical manifestations and diagnosis. Up to Date. 2015. Available from [https://www.uptodate.com/contents/peptic-ulcer-disease-clinical-manifestations-and-diagnosis?source=search\\_result&search=peptic%20ulcer%20disease&selectedTitle=2~150](https://www.uptodate.com/contents/peptic-ulcer-disease-clinical-manifestations-and-diagnosis?source=search_result&search=peptic%20ulcer%20disease&selectedTitle=2~150)
9. Vorvick, L.J. Gallstones. The New York Times Health Guide. 2011. Available from <http://www.nytimes.com/health/guides/disease/gallstones/overview.html#Symptoms>

10. Afdhal, N.H. Approach to the patient with incidental gallstones. Up to Date. 2016. Available from [https://www.uptodate.com/contents/approach-to-the-patient-with-incidental-gallstones?source=search\\_result&search=cholelithiasis&selectedTitle=1~150](https://www.uptodate.com/contents/approach-to-the-patient-with-incidental-gallstones?source=search_result&search=cholelithiasis&selectedTitle=1~150)
11. Lai, M. Budd-Chiari syndrome: Epidemiology, clinical manifestations, and diagnosis. Up to Date. 2017. Available from [https://www.uptodate.com/contents/budd-chiari-syndrome-epidemiology-clinical-manifestations-anddiagnosis?source=search\\_result&search=budd%20chiari%20syndrome&selectedTitle=1~125#H79562169](https://www.uptodate.com/contents/budd-chiari-syndrome-epidemiology-clinical-manifestations-anddiagnosis?source=search_result&search=budd%20chiari%20syndrome&selectedTitle=1~125#H79562169)
12. Gerstle, J.T., Chiu, P. and Emil, S. Gastric volvulus in children: lessons learned from delayed diagnoses. *Seminars in Pediatric Surgery*. 2009; 18(2):98-103.